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ORIGINAL

Bridging the Gap: The Role of Innovation in Connecting Design Thinking, Entrepreneurship Education, and Business Success

Cerrando la brecha: el papel de la innovación en la conexión entre el Design Thinking, la educación empresarial y el éxito empresarial

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ABSTRACT

Introduction: innovation is a critical driver of business success, especially in today's dynamic global economy. This study investigates how design thinking (DT) and entrepreneurship education (EE) impact business success (BS) in Pakistani institutions, with a focus on the mediating role of innovation. The research highlights the synergy between DT and EE in fostering environments where students can develop innovative business ideas.
Method: a systematic sampling approach was used, involving 260 students from various universities to ensure a comprehensive assessment of the impact of EE and DT on BS. SPSS and Smart PLS was used to analyze the data.
Results: the study's findings emphasize innovation's crucial role in linking entrepreneurship education and design thinking with business success. By identifying how innovation bridges these components, educational institutions can enhance their curricula to better equip students with entrepreneurial skills
Conclusions: this research provides valuable recommendations for refining educational strategies to cultivate innovative mindsets, preparing students for the challenges of the modern business world.

Keywords: Entrepreneurship; Education; Design Thinking; Innovation; Business Success.

RESUMEN

Introducción: la innovación es un factor decisivo para el éxito empresarial, especialmente en la dinámica economía global actual. Este estudio investiga cómo el pensamiento de diseño (DT) y la educación empresarial (EE) afectan al éxito empresarial (BS) en las instituciones pakistaníes, centrándose en el papel mediador de la innovación. La investigación destaca la sinergia entre el DT y la EE en el fomento de entornos en los que los estudiantes pueden desarrollar ideas empresariales innovadoras.
Método: se utilizó un enfoque de muestreo sistemático, en el que participaron 260 estudiantes de varias universidades para garantizar una evaluación integral del impacto de la EE y el DT en el BS. Se utilizó SPSS y Smart PLS para analizar los datos.

Resultados: los hallazgos del estudio destacan el papel crucial de la innovación en la vinculación de la educación empresarial y el pensamiento de diseño con el éxito empresarial. Al identificar cómo la innovación une estos componentes, las instituciones educativas pueden mejorar sus planes de estudio para equipar mejor a los estudiantes con habilidades empresariales.
Conclusiones: esta investigación proporciona valiosas recomendaciones para refinar las estrategias educativas para cultivar mentalidades innovadoras, preparando a los estudiantes para los desafíos del mundo empresarial moderno.

Palabras clave: Emprendimiento; Educación; Design Thinking; Innovación; Éxito Empresarial.

INTRODUCTION

This study offers a thorough analysis of Pakistan's existing entrepreneurial education system and the technological components that influence it. The number of institutions offering entrepreneurship degrees has increased significantly in Pakistan in recent times, to provide students with the expertise they need to launch and effectively manage their enterprises. Over 200 universities are offering entrepreneurial programs in Pakistan, according to a study of 13 distinct sources about the subject. The majority of these institutions offer curricula by contemporary technology and global norms. Malik et al., (2023) state that Pakistan has given entrepreneurship education a lot of attention since 2010, which has increased the number of students enrolling in entrepreneurial programs. Alam et al., (2023) state that by 2022, the majority of Pakistani universities will have incorporated entrepreneurship programs into their curricula. To educate entrepreneurship to the students, several universities have also launched business development initiatives and incubation facilities (Munawar et al., 2023).

Furthermore, technology plays a significant role in advancing entrepreneurial education in Pakistan. Asad et al., (2023) found that over 70 % of colleges have integrated cutting-edge technology into their entrepreneurship curricula, drawing students' attention to e-commerce and digital business structures. Additionally, by utilizing platforms for distance learning, several Pakistani educational institutions are extending their curricula on entrepreneurship (Hanan et al., ,2021). Vecchiarini et al., (2023) came to a finding in their investigations that using design thinking improves the chances of business success while entrepreneurship education is crucial in helping students build their entrepreneurial abilities. Asad et al., (2023) discovered that incorporating contemporary technology into entrepreneurial education fosters students' innovative thinking, which aids in the creation of novel business ideas. Muhammad et al., (2023) claim that EE assists students make better choices and lessens their concerns of failing in business.

Kumar et al., (2020) showed that Pakistani students pursuing entrepreneurship have more effective business endeavors, particularly once they apply the DT principles. Verma et al., (2023) discovered that EE graduates have higher inventiveness and imagination in their company concepts, which ensures the growth of their ventures. Ripolles et al., (2023) claims that students who pursue entrepreneurship become more self-assured and independent, which helps them run their firms more successfully. Arup et al., (2023) found that incorporating design thinking into EE greatly enhances students' capacity for business management and execution. Singh et al., (2024) discovered through his study that EE helps students build their capacity for solving issues and gets them ready to handle the issues of the commercial world. Cristina et al., (2024) showed in their research that entrepreneurial education makes students more creative and dynamic—two qualities that are essential to BS. EE equips students for enduring achievement in business endeavors, according to Qiu et al., (2023). Preiksaitis et al., (2023) assert that applying DR concepts to EE improves students' chances of succeeding as entrepreneurs. Tran et al., (2024) discovered that students who pursue entrepreneurship launch more successful and successful businesses. Winkler et al., (2023) found that EE helps students make more informed business judgments and lowers the likelihood of failing businesses.

The employment of contemporary technology in EE, as stated by Bancevic et al., (2023), improves students' business inventiveness, something that's crucial for profitability. Anwar et al., (2020) found that entrepreneurship students write more inventive and successful business concepts. Based on Bhandari et al., (2023), students' chances of succeeding as entrepreneurs rise when DT components are included in EE. Landoli et al., (2023) found that EE equips students to handle the rigors of the corporate environment. Saritepeci et al., (2024) found that students' business concepts are more innovative and creative when they utilize contemporary technologies in EE. The secret to their enterprise achievement, according to Soomoro et al., (2024), is that students who pursue entrepreneurship become more adaptable and prepared to handle the demands of the commercial world. Alam et al, (2023) discovered a vacuum in their study, namely that Pakistan's entrepreneurial school program lacks design thinking rules, which restricts students' innovation. DeWaters et al., (2023) noted that the dearth of study on the efficient application of contemporary technologies in entrepreneurship education

has left students' online business abilities underdeveloped. Kumar et al., (2023) discovered that the effect of innovation on students' entrepreneurial performance in entrepreneurship education is not well studied. Arup et al., (2023) discovered a gap that makes it difficult to evaluate students' entrepreneurial performance because there aren't enough ongoing research on the effects of entrepreneurship education in Pakistan.

Qiu et al., (2023) noted that a dearth of studies has been conducted on the critical role that sophisticated technology and design thinking play in entrepreneurship education. Crosina et al., (2024) discovered that the body of study on the connection among BS in Pakistan and EE is low. Alam et al., (2023) noted that the study literature on students' entrepreneurial creativity in the context of EE is lacking. Asad et al., (2023) discovered a research gap, there is a dearth of information on the real-world implementation of DT concepts in Pakistani entrepreneurship education. Hanan et al., (2021) highlighted the paucity of research on how contemporary technology affects students' BS in Pakistani EE. Muhammad et al., (2023) discovered a vacuum in the literature, there isn't many long-term research on how innovation affects students' BS in Pakistani EE. This study aims to examine the elements that can lead to successful entrepreneurship and offer practical suggestions for academic establishments. Using the systematic sampling method, a sample of 260 students was taken. Examining the effects of EE in Pakistani institutions that integrate DT and cutting-edge technology within their curricula is the primary goal of the study. Data were gathered from questionnaires and interviews conducted with staff members at various universities. SPSS software was then used to examine the collected data and assess the study's results.In addition to highlighting how DT and cutting-edge technology might support student BS in EE, this study aims to fill the previously highlighted research holes.

THEORETICAL BACKGROUND

Students are guided towards corporate innovation by employing imaginative and user-focused ways in conjunction with Design Thinking Theory to address issues (Zeng et al., 2023). According to the constructivist learning theory, students are engaged in their education, which fosters the growth of their entrepreneurial abilities (Engles et al., 2024). According to entrepreneurship theory, spotting and seizing chances is the key to running a successful firm, and EE makes this possible (Kumar et al., 2020). According to the Theory of Planned Behavior, someone's conduct is dictated by his objectives and controllable circumstances that are essential for achieving success in business (Muhammad et al., 2023). According to the innovation diffusion theory, BS requires the spread of novel concepts and technological advancements (Hanan et al., 2021). According to the Decentrated Learning Theory, students' understanding is customized based on their unique skills and backgrounds, which influences their likelihood of succeeding as entrepreneurs (Jiang et al., 2023). According to the Double Loop Learning Theory, in order for students to make more effective decisions, they must reassess their mindsets and methods of thinking (Martins et al., 2023). According to the self-efficacy theory, a person succeeds in the business sector because he believes in himself and his talents (Rodrigues et al., 2023).

According to the Design Science Research Theory, addressing business challenges requires design-based study (Saritepeci et al., 2024). Constructivism Theory, that works well in EE, holds that learning is based on the knowledge and experiences of a person (Soomoro et al., 2024). According to the Transformative Learning Theory, learning alters a person's thoughts and behaviors, which is essential for achieving success in business (Sitaridis et al., 2024). According to the self-determination theory, an individual's autonomy and motivation set him up for accomplishment in the business sector (Atrup et al., 2023). According to the Design Learning Theory, encouraging students to acquire knowledge through design concepts fosters their creativity (Muhammad et al., 2023). Based on the situated learning theory, which is crucial for entrepreneurship success, learning occurs in accordance with real-world experiences and the surrounding context (Zeng et al., 2023). According to the Community of Practice Theory, knowledge occurs in a collaborative setting, which works well for EE (Wang et al., 2023). According to control theory, BS is dependent on a person's capacity to exert oversight of what they do. (Qiu et al., 2023). According to the emotional intelligence theory, an individual succeeds in the corporate sector because of his or her capacity for empathy (Vecchiarini et al., 2023). According to the capacity-building theory, EE is crucial for enhancing pupils' capacities (Qiu et al., 2023). According to the theory of decentralized control, each person's autonomy and self-reliance matter when making business choices (Su et al., 2023).

According to sociocultural theory, a person's societal and cultural surroundings have an impact on their ability to succeed as an entrepreneur (Sitaridis et al., 2024). According to the action learning theory, gaining knowledge via real-world experience is beneficial for entrepreneurship success (Rodrigues et al., 2023). According to the self-regulation theory, a person succeeds in business because he has authority over every choice they make in life (Soomoro et al., 2024). BS depends on group learning, according to the Collaborative Learning Theory (Kumar et al., 2020). According to the self-concept theory, a person's sense of self and level of self-worth are essential for success in the workplace (De Waters et al., 2023). According to the Cultural Constructivism Theory, learning occurs within a person's societal and cultural environment, which is beneficial for entrepreneurship success (Kurek et al., 2023). According to the Design-Based Learning Theory, students' inventiveness and achievement as entrepreneurs depend on their ability to learn through design concepts (Zeb

et al., 2023).

Hypothesis Formulation

The method of teaching students how to develop, plan, and implement business concepts practically is known as Entrepreneurial Education (EE). The goal of this curriculum is to give students the abilities, perspectives, and know-how required to succeed as entrepreneurs (Alam et al., 2023). Business success (BS) is the accomplishment of a person or an organization via business operations; this includes monetary earnings, stable markets, brand awareness, and customer pleasure (Engles et al., 2024). Singh et al., (2024) discovered that EE improved students' readiness for profitable entrepreneurial endeavors, boosting the economic feasibility of their companies. Ripolles et al., (2023) emphasized that EE assisted the students in bringing their business concepts to life, which enabled their companies to take off in the market quickly. Zeb et al., (2020) claim that EE helps students develop their entrepreneurial abilities so they can successfully handle business challenges. Singh et al., (2024) discovered that by educating students about contemporary business patterns, EE helped them better satisfy the demands of consumers. Preiksaitis et al., (2023) noted that EE helped students become more self-assured entrepreneurs, allowing them to successfully manage their own firms.

Qiu et al., (2023) discovered that EE assisted students with business planning, which improved the achievement of their enterprises. Vecchiarini et al., (2023) noted that students were able to make good business judgments by using EE to assist them in recognizing commercial prospects. Arup et al., 2023) discovered that EE improved students' capacity to solve business issues, which improved company outcomes. Engles et al., (2024) noted that EE made it possible for students to take participation in business competitions, which enhanced the achievement of their companies. Anwar et al., (2020) discovered that by assisting students in putting their business strategies into action, EE improved the market for their ventures. Christensen et al., (2023) noted that EE gave students the ability to use contemporary technology, that helped their firms succeed. Gama et al., (2023) discovered that EE aided students in appreciating the risks associated with various business prospects, allowing them to make better business choices. Kurek et al., (2023) noted that EE assisted students in locating business prospects, allowing them to take a greater advantage in the marketplace. Malik et al., (2023) discovered that EE assisted students in creating business strategies, which helped the enterprises succeed financially. The results of this study demonstrate that EE improves BS as well as education and gives students the abilities and information they need to start profitable businesses. Following these investigations, the ensuing hypothesis was developed:

H1: Entrepreneurship Education has a significant impact on Business Success.

DT is a human-focused approach that helps solve difficult challenges and come up with unique solutions. It entails identifying issues, identifying user demands, coming up with original concepts, and creating prototypes (Verma et al., 2023). Atrup et al., (2023) discovered that using DT techniques produced innovative answers to business issues, which enhanced company performance. Qiu et al., (2023) also noted that DT assisted in the creation of business initiatives, which facilitated the success of the businesses. Preiksaitis et al., (2023) assert that DT significantly influenced the development of business systems, improving the company's standing in the marketplace. Zeng et al., (2023) discovered that DT aided in a deeper comprehension of client wants, resulting in superior commercial goods and services. Bustard et al., (2023) noted that the application of design thinking increased the whole BS by streamlining company operations. Engles et al., (2024) observed that DT aided in the discovery of fresh business prospects, resulting in a boost to company expansion. Malik et al., (2023) cited the fact that DT enhanced the caliber of company judgments, which enhanced business outcomes. Gama et al., (2023) discovered that employing DT principles fosters corporate success by increasing startup creativity. Muhammad et al., (2023) noted that DT increased company groups' inventiveness and produced new business prospects and alternatives. Zeb et al., (2020) discovered that using design thinking enhanced client interactions, and ultimately raised the company's profile in the marketplace. Woraphiphat et al., (2023) noted that DT provided practical answers to corporate problems, resulting in higher business success. Vecchiarini et al., (2023) discovered that the application of design thinking enhanced corporate strategy and hence improved business efficiency. Zeb et ., (2020) noted that putting design thinking ideas to use fosters company innovation and originality, both of which are essential for successful business operations. Verma et al., (2023) discovered that using design thinking to solve challenges in the business world resulted in novel concepts and corporate expansion and success. These study results attest to the beneficial effects of design thinking on company success and its ability to facilitate innovative and efficient problem-solving. After these investigations, a subsequent hypothesis was developed.

H2: Design Thinking has a significant impact on Business Success.

The process of developing and introducing novel concepts, goods, or services is referred to as innovation. It is essential for company growth and achievements. The method of teaching students how to develop, plan,

and implement business concepts in real-world settings is known as Entrepreneurial Education (EE) (Engles et al., 2024). DT is a human-focused approach that helps solve difficult challenges and come up with original solutions (Hanan et al., 2021). Brand identification, consumer contentment, stable markets, and financial viability are all referred to as BS (Muhammad et al., 2023). Gama et al., (2023) discovered that innovation can aid in converting EE talents into BS. Alam et al., (2023) stated that innovation increases the influence of business education, resulting in BS. Innovation, as stated by Bender et al., (2023), improved the advantages of EE, which raised BS. DeWaters et al., (2023) discovered that innovation was crucial in amplifying the effect of EE, which boosted corporate expansion. Bustard et al., (2023) stated that innovation brought new techniques to bear that were discovered through EE, resulting in BS. Zeb et al., (2020) discovered that using DT rules, innovation increased BS. Ewim et al., (2023) demonstrate how innovation boosts DT methods' effectiveness and produces BS. Munawar et al., (2023) discovered that innovation increased the effectiveness of DT's impacts and enhanced company outcomes.

Nazir et al., (2024) stated that innovation created new business prospects by making the DT concepts essential to BS. Wang et al., (2023) discovered that DT innovation produced creative approaches that resulted in BS. Zeb et al., (2020) noted that innovation increased the applicability of DT concepts for business growth, leading to an improvement in corporate performance. Zeng et al., (2023) observed that innovation enhanced BS by making the consequences of DT more feasible. Woraphiphat et al., (2023) noted that fresh business ideas were produced as a result of innovation strengthening the connection between DT and BS. Christensen et al., (2023) discovered that innovation enhanced the correlation between success and business education, resulting in higher corporate growth. Kurek et al., (2023) noted that innovation improved the EE-BS link, leading to an increase in BS generally. Carella et al., (2023) discovered that innovation aided in bringing concepts acquired via EE to fruition in the marketplace. Hanan et al., (2021) noted that DT helped innovation make BS work better, leading to the creation of novel business models. Bender et al., (2023) discovered that innovation raised BS by enhancing the effect of EE. Jiang et al., (2023) emphasized that innovation aided in the efficient use of DT approaches, leading to a rise in BS. Nazir et al., (2024) discovered that the abilities obtained via EE were more useful for BS due to innovation. Rodrigues et al., (2023) stated that innovation helped enterprises adhere to DT rules, that enhanced business outcomes. Discovered that innovation improved the bond between EE and BS. Sitaridis et al, (2024) noted that DT helped innovation find commercial prospects more successfully, which resulted in BS. Munawar et al, (2023) discovered that innovation amplified the effect of EE, resulting in higher BS rates. Engles et al., (2024) stated that DT enabled innovation to produce novel approaches, that increased BS. These study results attest to the fact that innovation is essential to raising BS and augmenting the advantages derived from EE and DT.

H4: Innovation meditates the relationship between design thinking and business success.

H5: Innovation mediates the relationship between Entrepreneurship education and Business Success.

METHOD

Closed-ended questionnaires are used to gather and evaluate primary data for this quantitative, preliminary investigation. The goal of this research is to determine how innovation functions as a mediator among EE and DT and assess how it affects BS. Cross-sectional analyses were gathered in order to examine the research's hypotheses. Students enrolled at Pakistani universities offering EE make up the research sample. 432 questionnaires were given with the intention of gathering data; ultimately, the universities in Pakistan returned 282 legitimate surveys. Data gathering took place over the course of a four-month period, from June to August of 2024. University instructors and students received surveys, and every 260ur participant was chosen using the systematic sampling approach. To gauge EE, a 13-item scale is employed. To quantify DT, a 9-item scale was employed. Innovation is measured using a 5-item scale that addresses the application of data from various places. BS is measured using a 10-item scale that encompasses the accomplishment of business goals. EE Every item has undergone a unidimensional analysis to compensate for their understanding levels. Furthermore, research done in comparable nations has also carried out univariate variable evaluation. Unidimensional measurements are crucial for a clear evaluation of the connections between factors since they quantify individual traits, which guarantees scale reliability. The material of the tools was validated regardless of whether they were taken from previous research and utilized during the gathering of information. For hypothesis evaluation, SMART PLS-3 with the SEM approach was employed. PLS-SEM was selected primarily because it is thought to be the most effective for developing theories and evaluating assumptions. PLS-SEM is being used in this study to address basic random sampling issues. The examination of the gathered data and the conclusions derived from it are covered in another part.

RESULTS

To confirm the validity and reliability of the tool, the outside model was examined before the model inside was examined (AlSokkar et al., 2025; Alzghoul et al., 2024; Ezmigna et al., 2024a, 2024b). Initially, item loadings

were originally determined in this sense (Aristovnik et al., 2020; A. A. Sharabati et al., 2010)(A.-A. A. Sharabati et al., 2022). The item loading statistics are displayed in table 1. The results showed that the estimated item loadings varied from a higher limit of 0,91 to a lower limit of 0,737. According to the evaluation, just one item each from DT, innovation, and BS—as well as one item from BS—were eliminated for additional examination since their item loading was less than 0,7. Items with loadings greater than 0,7 are deemed suitable for inclusion in the framework.

Table 1. Outer Loadings

Factors	Items	Loading Parameters
Design Thinking	DT1	0,886
	DT2	0,874
	DT3	0,843
	DT4	0,916
	DT5	0,804
	DT6	0,758
	DT8	0,752
	DT9	0,873
Entrepreneurship Education	EE1	0,813
	EE2	0,813
	EE3	0,858
	EE4	0,858
	EE5	0,868
	EE6	0,893
	EE7	0,851
	EE8	0,855
	EE9	0,861
	EE10	0,894
	EE11	0,817
	EE12	0,861
	EE13	0,878
Innovation	I2	0,881
	I3	0,863
	I4	0,867
	I5	0,852
Business Success	BS1	0,806
	BS2	0,781
	BS3	0,769
	BS4	0,831
	BS5	0,761
	BS6	0,822
	BS7	0,815
	BS8	0,793
	BS9	0,745

The following action is calculating CA, CR, AVE, and discriminant validity after looking at the outer loadings. Determined that a CA criterion of 0,7 and higher was reached. Additionally, the CR indicator assesses internal coherence. Its barrier value is 0,60 (Zeb et al., 2020), and its result ranges from 0 to 1. On the other hand, Hanan et al., (2021) proposed that values of 0,7 and above have greater suitability. Additionally, AVE is used to quantify the factors' convergent validity. Recommended that the limit for AVE is 0,50 and higher, while the CR of the concept evaluates the conceptual connection of objects inside the factor (Soomoro et al., 2024).

Additionally, discriminant validity—which measures how much one component differs from the others—was evaluated. Muhammad et al., (2023) demonstrated how the Fornell-Larcker criterion was the more widely used technique for analyzing discriminant validity. Considered is discriminant validity The estimated amount for the identical component must be greater than the same amount across each additional construct through calculating the square root of the AVE for every variable (Hanan et al., 2021). Using the same methodology, discriminant validity was investigated in this investigation, and the findings supported its validity. Table 2 lists the results of CA, CR, AVE, and Discriminant Validity for every factor. The calculated amounts for CA are 0,931, 0,961, 0,875, and 0,917; as a result, the results obtained for each parameter exceed the 0,7 minimum threshold. Additionally, the computed CR figures for every factor are 0,945, 0,966, 0,913, and 0,930, each of that are higher than the 0,70 criterion. Similarly, the computed values for AVE are 0,710, 0,728, 0,740, and 0,626, all of which are higher than the 0,50 criterion. Additionally, discriminant validity was guaranteed by the outcomes of every component.

Table 2. Discriminating validity, validity of concepts, and reliability

Variables	Cronbach's Alpha (CA)	Composite Reliability (CR)	AVE	Discriminate Validity			
				DT	EE	I	BS
DT	0,931	0,945	0,710	0,834			
EE	0,961	0,966	0,728	-0,012	0,848		
I	0,875	0,913	0,740	0,210	0,628	0,854	
BS	0,917	0,930	0,626	0,025	0,606	0,703	0,791

An additional technique to guarantee the discriminant validity of the tool was to assess the HTMT ratio, which serves as a means of confirming its discriminant validity. The HTMT technique verifies that there is an important distinction between the items utilized for measuring one of the two elements in the framework and the items utilized to assess the additional component. Table 3 displays the HTMT ratio, which indicates that the numbers are extremely low. This indicates that the parameters employed to assess the concept have discriminant validity.

Table 3. HTMT Ratio

	DT	EE	I	BS
DT				
EE	0,525			
I	0,400	0,475		
BS	0,410	0,495	0,522	

Once the dependability, consistency, and discriminant validity had been established, the structural framework evaluation occurred for assessing each hypothesis. First, the model's interior was found, which included the path coefficients and the importance of direct impacts between both IV and DV. As a result, an analysis of the direct impacts of EE over BS revealed an inconsequential connection (β: -0,012, t: 0,810, p: 0,417). Moreover, there is a noteworthy correlation between DT and BS (β: 0,260, t: 2,301, p: 0,029). Additionally, DT also demonstrated an essential connection with Innovation (β: 0,225, t: 2,647, p = 0,012) in the analysis of the direct consequences of IV as an intermediary. Likewise, there is a noteworthy correlation between EE and innovation (β: 0,620, t: 7,460, p: 0,000). Finally, there is a noteworthy correlation between innovation and BS (β: 0,580, t: 5,667, p: 0,001). Table 4 lists the outcomes for each of the direct links. The primary goal of the research was to verify that innovation's mediation function had been verified through the use of SEM indirect impacts, which was done after the direct associations were analyzed. Innovation has a mediator's position among EE and BS and also among DT and BS, according to its indirect consequences. Innovation plays a substantial mediating function among DT and BS (β: 0,135, t: 2,213, p: 0,033). Additionally, innovation has a substantial mediating function among EE and BS (β: 0,372, t: 5,096, p: 0,001). Table 5 makes reference to the results. Innovation plays a major mediating function among DT and BS plus EE and BS, according to an investigation into the mediating impact of innovation via indirect consequences. Additionally, the reality that variance explanation rose to 58,1 % from 42,5 % after innovation was added to the framework illustrates the significance of the mediator. Additionally, the F2 score of 0,292 indicates that a mediator has a moderate impact size. It is computed by dividing the distinction between reported variance regardless of the mediator by one less than clarified variance with

mediation seen in table 5.

Table 4. Direct Impacts

Path Coefficients Directly	Initial Sample	Sample Mean	Std. Deviation	T-statistics (O/STDEV)	P-Values
EE>BS	-0,012	-0,010	0,110	0,810	0,417
DT>BS	0,260	0,265	0,113	2,301	0,029
DT>I	0,225	0,232	0,085	2,647	0,012
EE>I	0,620	0,615	0,089	7,460	0,001
I>BS	0,580	0,576	0,102	5,687	0,001

Table 5. Indirect Impacts

Path Coefficients Indirectly	Initial Sample	Sample Mean	Std. Deviation	T-statistics (O/STDEV)	P-Values	Interval of Confidence	
						3,4 %	96,6 %
DT>I>BS	0,135	0,142	0,061	2,213	0,033	0,025	0,350
EE>I>BS	0,372	0,373	0,073	5,096	0,000	0,010	0,340

Once the path coefficients and mediation impacts have been verified, the Stone-Geisser indication, which validates the inner system's expected influence, may be used to verify the predictive value of the attracted approach. This may be accomplished through using the blindfolding technique to determine the Stone-Geisser test, which may be utilized to verify cross-validated redundant. The outcomes of cross-validated redundancies for BS and innovation are shown in Table 6. According to Table 6's cross-validated redundancy results, most of the measured Q2 values—including those for BS (0,319) and Innovation (0,309)—are greater than zero, indicating that the framework's predictive significance is considerable. Hanan et al., (2021) suggested that models have strong predictive validity if their Q2 scores are above 0. And that they lack predictive significance if their Q2 levels are lower than 0.

Table 6. Redundancy Cross-Validation

Variables	SSO	SSE	Q' 2 (=1-SSE/SSO)
Innovation	420	290,150	0,309
Business Success	920	625,740	0,319

DISCUSSION AND CONCLUSIONS

In order to investigate the connection between DT, EE, and BS, this investigation integrates current and proven hypotheses through the use of a novel technique. The study's findings show that although innovation has an essential mediation function in this connection, DT and EE have a direct impact on BS. With an amount of -0,0089 (p-value = 0,419), the direct impact of EE on BS is negligible. This indicates that EE does not have a direct connection to business success in the overall setting of this research. With an amount of 0,245 (p-value = 0,035), DT exerts a direct impact on BS that is both significant and beneficial. This indicates that attaining BS is positively impacted by DT techniques. DT has a 0,213 (p-value = 0,017) advantageous and substantial impact on innovation. It demonstrates how DT fosters creativity in a commercial setting. EE significantly boosts invention, as evidenced by its worth of 0,634 (p-value = 0,000).

This indicates that EE greatly improves capacity for inventiveness. The study also demonstrates that DT concepts are useful in boosting the long-term viability and success of enterprises. Studies show that DT increases BS. Alam et al., (2023) claim that the use of DT improves the organization's openness and decision-making capacity, which results in BS. In the same way, EE also directly affects BS. According to an investigate by (Nazir et al., 2024), encouraging EE is crucial for helping young people improve their entrepreneurial abilities and make stronger business choices, which raises the BS rate. This study further supported the idea that innovation plays a mediating function by showing how innovation amplifies the impacts of EE and DT. The method of innovation, based on (Martins et al., 2024), aids businesses in breaking into fresh markets and seizing unexplored possibilities. Innovation gives businesses an edge over others, making it essential to BS, claims (Gama et al., 2023).

The studies by (Malik et al., 2023) and (Hanan et al., 2021), showed the existence is a continuous connection between EE and DT that results in BS, making this work even more important. Lastly, the research's findings

support the findings of (Asad et al., 2023) and (Alam et al., 2023), who highlighted the importance of EE and DT innovation for BS. It is crucial to work in tandem with this work to close a research hole regarding the integrated impact of DT and EE, alongside the mediating function of innovation, and suggest areas for future investigation. Figure 1, represents the conceptual framework of the study. A few significant elements that might be crucial for further investigation can be discovered while taking into account the constraints of this investigation.

The participants in this investigation were only academic staff and students at Pakistani universities offering EE. It's feasible that outcomes from various geographic locations or educational institutions can vary. Cross-sectional data, which gathers information at a certain point in time, is used in the present research. Consequently, the research was unable to incorporate alterations over time, that could potentially constrain the comprehension of the enduring impacts of EE and DT on BS. Self-assessment is the foundation for answering the research's questionnaires. As a result, according to predicted replies, individuals' comments could contain inaccuracies or be biased by themselves. The variables investigated were studied in a unidimensional manner, making it impossible to properly.

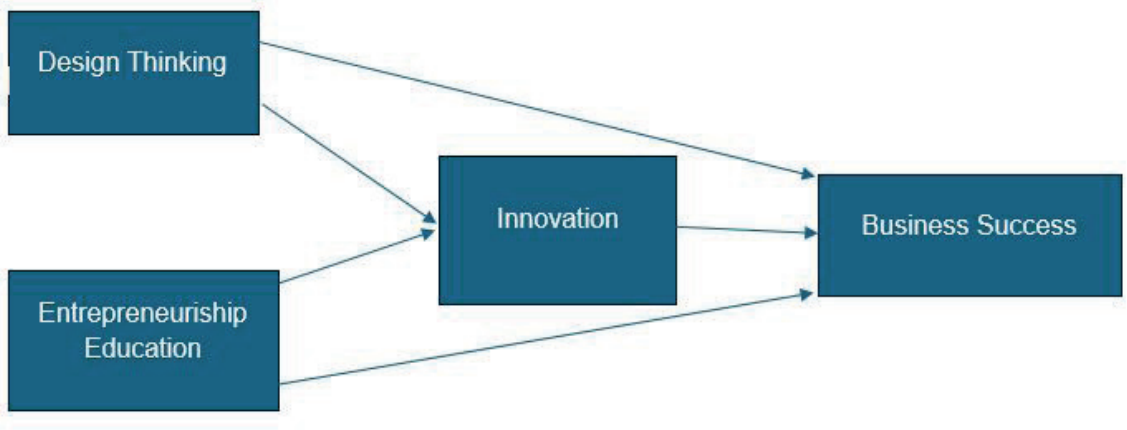

Figure 1. Conceptual framework of the study

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